CLAIMS

What is claimed is:

1. A method for approximating a quadratic Bezier curve with straight edges, the curve being represented by a first anchor point, a control point, and a second anchor point, the method comprising:

(1) pushing the first anchor point, the control point, and the second anchor point into a memory stack;

(2) popping out the top three points in the memory stack as points a2, c, and a1;

(3) computing a flatness F of a line formed between the points a2 and a1, wherein the flatness F is calculated as follows:

$$F(a1, c, a2) = S(a1, c, a2) / |a1a2|,$$

where S(a1, c, a2) is a triangular area formed by the points a1, c, and a2, and $|a1a2|$ is the distance between the points a1 and a2;

(4) determining if the flatness F is less than a threshold;

(5) if the flatness F is less than a threshold:

(a) adding an edge between the points a1 and a2 to an active edge list;

(b) pushing the point a1 back into the memory stack.

2. The method of claim 1, further comprising:

(6) if the flatness F is not less than a threshold:

(a) determining if the memory stack is full;

(b) if the memory stack is full:

(i) adding an edge between the points a1 and a2 to the active edge list;

(ii) pushing the point a1 back into the memory stack;

(c) if the memory stack is not full, dividing the quadratic Bezier curve as follows:

(i) determining a midpoint c1 in a line between the points a1 and c;

(ii) determining a midpoint c3 in a line between the points a2 and c;

(iii) determining a midpoint c2 in a line between the points c1 and c3;

(iv) pushing the points a2, c2, c3, c1, and a2 back into the memory stack;

(v) looping back to step (2) and repeating the above steps.

3. The method of claim 2, further comprising calculating S(a1, c, a2) as follows:

$$S(divided) = S(original) / 8,$$

wherein S(oroginal) is a previous triangular area and S(divided) is a subsequent triangular area.

4. The method of claim 1, further comprising dividing another quadratic Bezier curve at an inflection point to form the quadratic Bezier curve.

5. A method for approximating a quadratic Bezier curve with straight edges, the quadratic Bezier curve being represented by a first anchor point p0, a control point p1, and a second anchor point p2, the method comprising:

determining a first flatness of a line formed between the first anchor point p0 and the second anchor point p2, wherein the first flatness is a first quotient of (1) a first triangular area formed by the first anchor point p0, the control point p1, and

the second anchor point p2 divided by (2) a first distance between the first anchor point p0 and the second anchor point p2;

if the first flatness is less than a threshold, replacing the curve with an edge between the first anchor point and the second anchor point.

6. The method of claim 5, further comprising:

if the first flatness is greater than the threshold:

dividing the quadratic Bezier curve into a first portion and a second portion, wherein (1) the first curve comprises the first anchor point p0, a first intermediate control point c1(1), and a first intermediate anchor point c2(1), and (2) the second curve comprises the first intermediate anchor point c2(1), a second intermediate control point p1(1), and the second anchor point p2:

determining a second flatness of a line formed between the first intermediate anchor point c2(1) and the second anchor point p2, wherein the second flatness is a second quotient of (1) a second triangular area formed by the first intermediate anchor point c2(1), the second intermediate control point p1(1), and the second anchor point p2 divided by (2) a second distance between the first intermediate anchor point c2(1) and the second anchor point p2;

if the second flatness is less than the threshold, replacing the second curve with a second edge between the first intermediate anchor point c2(1) and the second anchor point p2.

7. The method of claim 6, wherein:

the first intermediate control point c1(1) is a midpoint in a line between the first anchor point p0 and the control point p1;

the second intermediate control point p1(1) is a midpoint in a line between the second anchor point p2 and the control point p1; and

the first intermediate anchor point c2(1) is a midpoint in a line between the first intermediate control point c1(1) and the second intermediate control point p1(1).

8. The method of claim 6, further comprising, if the second flatness is greater than the threshold:

dividing the second portion into a third portion and a fourth portion, wherein (1) the third portion comprises the first intermediate anchor point c2(1), a third intermediate control point c1(2), and a second intermediate anchor point c2(2), and (2) the fourth portion comprises the second intermediate anchor point c2(2), a fourth intermediate control point p1(2), and the second anchor point p2:

determining a third flatness of a line formed between the second intermediate anchor point c2(2) and the second anchor point p2, wherein the third flatness is a third quotient of (1) a third triangular area formed by the second intermediate anchor point c2(2), the fourth intermediate control point p1(2), and the second anchor point p2 divided by (2) a third distance between the second intermediate anchor point c2(2) and the second anchor point p2;

if the third flatness is less than the threshold, replacing the third curve with a third edge between the second intermediate anchor point c2(2) and the second anchor point p2.

9. The method of claim 8, wherein:

the third intermediate control c1(2) point is a midpoint in a line between the first intermediate anchor point c2(1) and the second intermediate control point p1(1);

the fourth intermediate control point p1(2) is a midpoint in a line between the second anchor point p2 and the second intermediate control point p1(1); and

the second intermediate anchor point c2(2) is a midpoint in a line between the third intermediate control point c1(2) and the fourth intermediate control point p1(2).

10. The method of claim 6, further comprising, if the second flatness is less than the threshold:

determining a third flatness of a line formed between the first intermediate anchor point c2(1) and the first anchor point p0, wherein the third flatness is calculated as (1) a third triangular area formed by the first intermediate anchor point c2(1), the first intermediate control point c1(1), and the first anchor point p0 divided by (2) a third distance between the first intermediate anchor point c2(1) and the first anchor point p0;

if the third flatness is less than the threshold, replacing the first curve with an edge between the first intermediate anchor point c2(1) and the first anchor point p0.

11. The method of claim 8, further comprising calculating the second and the third triangular areas as follows:

$$S(divided) = S(original)/8,$$

wherein S(oroginal) is a previous triangular area and S(divided) is a subsequent triangular area.

12. The method of claim 5, further comprising dividing another quadratic Bezier curve at an inflection point to form the quadratic Bezier curve.